

Playing with the Sun

**(and other forms of
sustainable energy)**

**A community of learners and
practitioner-researchers**

The idea for this project was hatched at Aarhus University's Interacting Mind Center (<https://interactingminds.au.dk>). In September and October of 2021, Ben visited the Center and was assigned an office with Amos. We began talking about our shared interests and aspirations regarding practitioner research—Amos in libraries and Ben in early childhood classrooms. Ben was also intrigued by an essay Amos had recently penned titled, *Playing with the Sun* (<https://hedge.amosamos.net/s/xfKYsl81H>).

A trip to REmida and the Loris Malaguzzi International Center in Reggio Emilia that October provided us a treasure trove of ideas. On returning from Italy, Amos began prototyping materials in collaboration with colleagues at Dokk1 (<https://dokk1.dk/>), an innovative library in Aarhus. We have started to experiment with pedagogical approaches around authentic inquiry in workshops at Dokk1 and beyond.

There are many details about our community we need to sort out (e.g., how many members will it have; if and where to seek funding). What we do know is that we aspire to create a hackable research blueprint to engage children and others as co-researchers to come up with insights no one has thought of before about the climate crisis.

This document is meant to introduce you to the community. Feel free to play with the ideas you read about here, let us know what you think, and reach out if you are interested in having your classroom, maker space, library or family join our community.

Best,

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What is worth knowing for today and tomorrow?

Project Zero's David Perkins asks this central question about education: What is worth knowing for today and tomorrow? With the world experiencing devastating heat waves, unprecedented wildfires, droughts, and super storms, and aware that the climate crisis will only continue to grow, our answer is that it is worth promoting:

- Understanding of, curiosities about, and sensitivities to sustainable sources of energy, and
- Strategies for collectively tinkering toward how to live sustainably and well

What do we mean by *sensitivity* to sustainable sources of energy? Consider the sailor and their relationship to the wind. A love of efficiency is built into the aesthetics of sailing. Beautiful sailing is to skillfully respond to the wind *as it is*, moment by moment. We believe this careful attention makes possible a respect, even reverence, for the wind, and by extension nature itself.

Consider the petrol-fueled powerboat driver who recognizes the high price of fossil fuels and decides to take up sailing. Some things are the same. But whereas before he could ignore all but the strongest winds, now a different kind of attention and relationship to nature is required. To be sure this relationship asks more of him, but he knows from speaking with other sailors that it is not without its rewards.

Today we must all learn how to be more like sailors, even if we never plan to set foot in a boat. Our aim is to create the conditions for people to explore and invent new kinds of relationships to sustainable energy that are similar to that of the sailor. We believe that developing these sensitivities as part of a community of practice will better position people to understand and be creative with the question of how to live sustainably.

Perkins also asks, "Where and how does learning thrive?" Regarding an understanding and ability to work together to address climate change, our answer involves three features of teaching and learning:

- Play materials, toys for a green generation, that will promote exploration of the affordances of sunlight, wind, and other sources of sustainable energy
- Authentic inquiry, where groups of learners explore, tinker, and play with ideas together, creating understandings that do not yet exist
- A community, where people are connected across the globe, learning from and with one another (and where their ideas are taken seriously)

Let's look at each feature in detail.

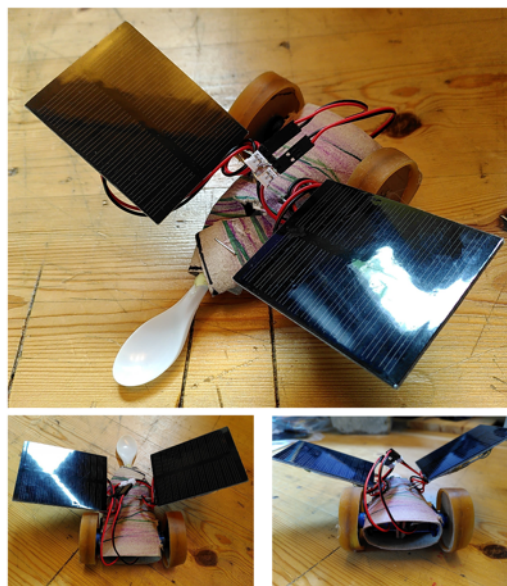
Play materials: Toys for a green generation

Humans use toys to explore the world. The toy truck is a quintessential play material children use to foster their understanding of how things work in the age of fossil fuels. They use it to understand actions and relationships by picking up and delivering materials, navigating roads, and of course filling it up with petrol to provide power.



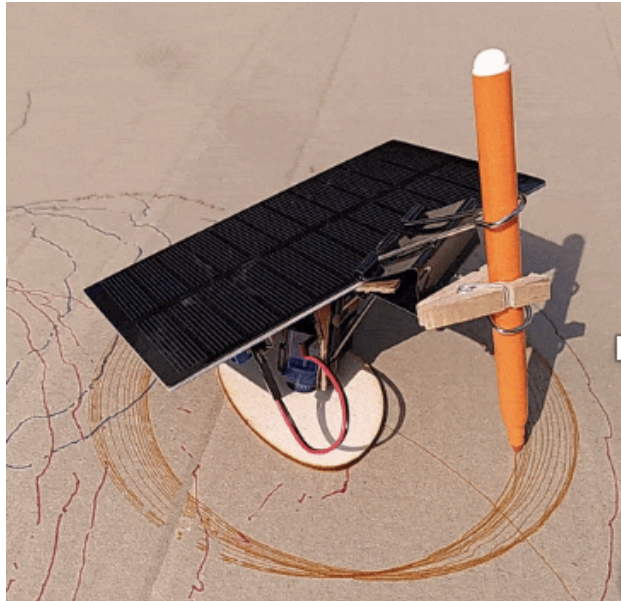
We aspire to create toys that enable children to explore and understand the world of sustainable energy. A few prototypes have been created as examples.

One is “The solar bug”, where players are invited to build a vehicle or creature (it is up to the learner to decide what they are creating) with two solar panels, each powering a motor. Using a mirror, they can then direct sunlight onto either panel, moving the bug either to the left or right.



“The Solar Drawing Machine” is a second prototype under development. Learners are given a base model that is powered entirely by the sun which they can modify to explore different possibilities. The speed of the machine’s rotation varies according to the solar

panel's orientation to sunlight. Learners can add elements to the machine (e.g., more and different colored markers) and vary the position of the solar panel (changing the speed of the machine).



Both the solar bug and the solar drawing machine are provocations that invite learners of all ages to an open-ended and playful encounter with the elements, properties, and relationships of solar energy.

We will continue to develop the solar bug and drawing machine and envision developing other tinkerable toys that put children into a relationship with the sun, wind, and other sources of sustainable energy. Our design principles for creating such toys are that they:

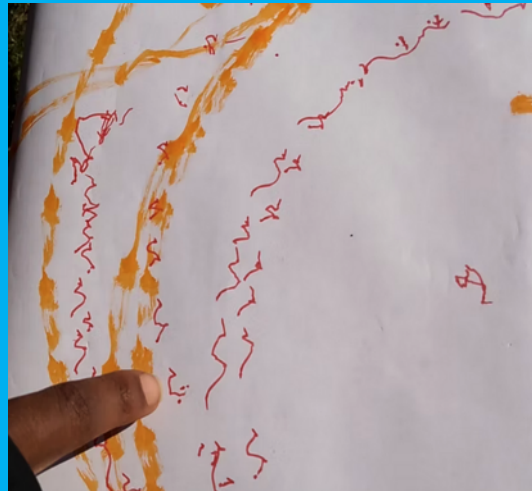
- Tightly couple energy use with energy generation.
- Enable exploration of relationships between sources of energy, such as the sun and wind, and the learner's creations.
- Offer direct experience of proportionality and qualities of different sustainable energy sources
- Tinkerable, facilitating creative exploration and self-expression

An example of how a group might explore with such toys is found in a workshop facilitated by Amos, where participants identified "cooperative mirrors" and "solography" (the writing of the sun).

Cooperative mirrors and solography: Some possibilities of the solar drawing machine

At a workshop in Copenhagen, Amos gave a group of artists and researchers time to explore solar drawing machines. The artists made a range of discoveries, including two Amos had not considered before. The first was using mirrors—sometimes attached to a drawing machine—that would help power **other** drawing machines. The second was more fanciful, the labeling of marks made by the machines “solography”, the writing of the sun.

Both of these ideas have the potential to be new provocations for future workshops. For example, Ben might introduce the idea of the solar drawing machine to his Kindergarten class, explain and demonstrate the idea of solargraphy, and invite the learners to make their own solar writing and interpret what it says. In this way their research builds on previous insights, and potentially leads to new ones.



Authentic inquiry: Creating understandings that do not yet exist

Authentic inquiry—where groups of learners explore, tinker, and play with ideas together—is a second feature that will support the learner’s exploration of sustainable energy. We imagine long term investigations, guided by facilitators who use pedagogical documentation to inform the direction of the inquiries, providing rich questions and provocations.

The results may be new ways to think about sustainability. The developmental psychologist Alison Gopnick calls four-year-olds “the R and D arm of humanity”, and it is well established that children are more agile, exploratory learners than adults. Hence their inclusion in our learning community.

We are not expecting children, or the community for that matter, to come up with technical discoveries that will solve climate change. But we are confident that community will see things anew. These ideas may not be actionable in an immediate sense but will help all of us imagine different futures.

A park where parents play with their children: An example of authentic inquiry

Each January kindergartners in the Boston Public Schools receive a letter from the mayor asking for their ideas about how to make the city fairer for everyone and more fun for children. In Calla Freeman's class, students spend six weeks designing a park that will encourage parents to play with their children. They brainstorm ideas, debate the merits of different proposals, come up with drafts, and ultimately construct a model of their park. Their model includes lockers to store mobile phones when families are playing, adult sized climbing equipment to make the park more pleasant for adults, and a snack bar that includes healthy foods (so parents won't insist children go home for lunch). While the park is never built, undoubtedly any adult encountering the children's ideas will reflect on their use of electronics, and perhaps stow them away more often when playing with their children. (See the Epilogue of *Children at the Center: Transforming Early Childhood Education in the Boston Public Schools* (2018) for more details of the park and the process of children engaging in authentic inquiry throughout the city).

How might this look? We can imagine facilitator asking a group questions about the idea of cooperative mirrors to power the solar drawing machines or about solography (what the sun is trying to communicate?). This second question is clearly fanciful. In the "An invitation to play" section we explain why it still may be a fun and useful question to explore. Whatever the provocation, our goal is to understand and document the learner's explorations such that their ideas can be shared with future participants, of all ages, throughout the community.

The questions explored will be authentic; of real interest to the learners. The inquiry's direction should not be predetermined, and be allowed to proceed in unforeseeable directions. At the same time, facilitators have an important role in supporting and sustaining the inquiry. Being part of a community will help facilitators in striking the balance between providing the right amount of support and allowing learners of all ages the autonomy needed for authentic inquiry.

The community: Reimagining the world together

The third feature that helps learning thrive: a community. Being part of a community, something bigger than oneself, can be energizing to children and adults alike. Further, by sharing ideas from disparate perspectives, the community has the potential to lead to new ideas that can change thinking and practices.

Our view of the community's potential is influenced by a new book by David Graeber and David Wengrow. In *The Dawn of Everything*, Graeber and Wengrow use recent advances in archeology to show that human history is one of groups of people

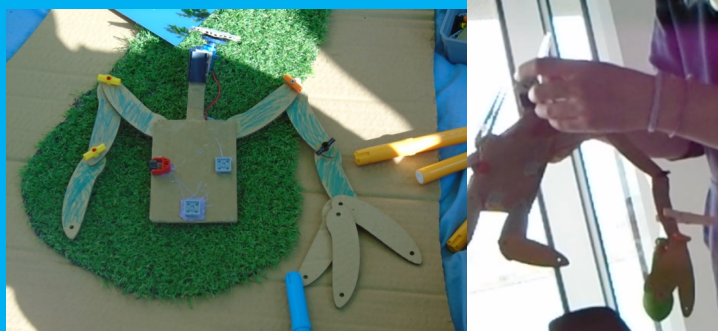
exploring, tinkering, and playing with technologies as well as different forms of social organization. They share examples of societies who, realizing they are on the wrong path, radically change direction. We are a species capable of great creativity. And change. As Graeber writes, "The ultimate hidden truth of the world is that it is something we make and could just as easily make differently."

We imagine the community as a place where good ideas beget other good ideas, or in more technical terms, a space for exploring the adjacent possible. The adjacent possible is an idea developed by the biologist and complexity scientist Stuart Kauffman, who observed that large-scale evolutionary change seems to be a result of an amalgamation of small, stepwise movements across the space of possibilities. Paper notes taped to a wall were just a step away from the post-it note, which in turn enables new forms of creativity for designers who use them to arrange and rearrange their ideas in group brainstorming sessions.

By mapping each group's exploration of the shared research questions, supported by documentation, our goal is to make playful exploration of the adjacent possible into a collective enterprise. Investigations in libraries, maker spaces, and classrooms will complement each other.

A mini-network experiment

In June Amos and Ben facilitated a workshop for 2nd graders at the International School of Billund (Denmark). After introducing materials (solar panels that connected to motors; card board pieces that could be linked together) half the class explored. After 25 minutes they explained their discoveries to their classmates who then got to play. After 25 minutes the second group shared their discoveries. Knowing we would be heading with the materials to a library next, children also suggest directions for a third group to explore. At the library (Dokk1), a group of adults picked up on the children's suggestions. The result was a chain of innovations that resulted in tubes to use air to move a "person's arms"



As part of the community, the facilitators will take part in practitioner-researcher, supporting each other's groups' exploration and developing insights into facilitating authentic inquiry.

An invitation to play

In his book *Wonderland*, Steve Johnson explains that many of the physical and conceptual technologies central to the modern world—rubber, probability theory, computers—originated in play. Graeber and Wengrow make a similar case about the importance of play in social innovation, serving as the genesis for both monarchies and democratic elections.

Which is a reason why we don't dismiss solography, the previously mentioned idea that the solar drawing machines are transcribing communication from the sun, as a potential topic for inquiry. Yes, this is a fanciful idea, and no, we don't believe the sun is writing messages to us. At the same time, this playful idea might be an entry point for young people to develop new relationships and sensitivities towards the sun. Who knows where an inquiry that starts with the question of solography might end?

Play is a key way people learn. It provides us with an engaging and low risk way to explore the world, creating what Thomas Hendricks calls, "laboratories of the possible." Such laboratories are urgently needed. Hence the title of our project, **playing** with the sun.

The climate crisis is an urgent and massive problem. It has no one solution, and demands all of us—government officials, business leaders, citizens, educators, and young people—address the problem. Approaches must include policy changes and scientific innovation. But let's not dismiss playful approaches—especially those that turn our day to day lives into laboratories of the possible--as part of the array of human tools we can bring to bear on the problem.

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